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**EXECUTIVE SUMMARY**  
**HYDROGEOLOGIC SUBSURFACE SITE INVESTIGATION - August 14 & 20, 1998**  
**SUGARBUSH SERVICE STATION**  
**WARREN, VERMONT**

KENT S. KOPTIUCH, Inc. (KSKGeoS™), under the authorization of Mr. Kerney Brown and the Vermont Department of Environmental Conservation (VT DEC), conducted a Phase II subsurface hydrogeologic investigation of the Sugarbush Service Station located on Route 100 Warren, Vermont.

- KSKGeoS™ completed the installation, development, and sampling of three (3) groundwater monitoring wells. One (1) existing site monitoring well and an on-site potable well were also sampled. Each of the water samples were analyzed under EPA method 8021B for BTEX and MTBE (purgeable aromatics) and under EPA modified Method 8015 for total petroleum hydrocarbons (TPH).
- Groundwater exhibits a north-northeasterly flow direction across the site. Gradient is approximately 1%. The rate of groundwater travel through the aquifer is approximately  $2.8 \times 10^{-2}$  gpd/ft<sup>2</sup>.
- No separate-phase petroleum hydrocarbon products were observed during soil boring, well installation, or groundwater sampling activities.
- Soils screened by PID for split spoon samples obtained during boring activities revealed only trace level volatile organic compounds (VOCs) ranging between 0.2 ppm and 0.6 ppm.
- None of the groundwater samples analyzed yielded any detectable impact by dissolved BTEX, naphthalene, 1-2-4 trimethylbenzene or 1-3-5 trimethylbenzene above a laboratory MDL of 1.0 µg/L, MTBE was detected in samples obtained from MW-1 at a concentration of 29.6 µg/L, and in samples obtained from MW-6 at 17.8 µg/L. All ground water samples yielded results below a detection limit of 0.1 mg/L as analyzed by EPA modified method 8015 for TPH.
- The subject site is supplied water by an on-site, tiled dug-well situated hydrologically upgradient of the former tank pit and former pump island. This potable well is not used for drinking water according to the site owner. Samples obtained from this well did not reveal detectable VOC impact, however MTBE was picked up at a trace below the MDL.
- The site also has a septic/leech field system associated with it which is located to the east of the former tank system location. A monitoring well (MW-2) installed in the general vicinity of this leech field did not yield any detectable VOCs.
- A review of ANR DEC files did reveal four hazardous sites within 1 mile of the subject site, however, these sites are sufficiently downgradient of the subject site, or within an unrelated drainage basin and do not present any identified risk to the subject site.
- An abutting site to the north, although not currently listed as a hazardous site with the VT DEC, did have a spill of fuel oil caused by recent floodwaters. Observations made at this adjoining property suggests that there exists a potential risk of fugitive fuel oil contaminants impacting the study site. Petroleum seeps associated with this fuel oil spill were observed entering the Mad River during KSKGeoS™'s visit on August 20, 1998.
- No further investigative measures are recommended for this site regarding the potential subsurface impact by VOCs from the former USTs. Due to the apparent residual presence of low level MTBE found in ground water samples, in combination with the potential incidence of petroleum hydrocarbon impact from upgradient source, KSKGeoS™ does recommend quarterly sampling of the on site potable well as a safety-net monitoring strategy.

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Phase (check one)		Type (check one)	
X	Initial Site Investigation		Work Scope
	Corrective Action Feasibility Investigation	X	Technical Report
	Corrective Action Plan		PCF Reimbursement Request
	Corrective Action Summary Report		General Correspondence
	Operations and Monitoring Report		

## HYDROGEOLOGIC SUBSURFACE INVESTIGATION

Sugarbush Service Station, Inc.  
Route 100  
Warren, Vermont  
44°08'05" North, 72°53'42" West

KSKGeoS™ Project #: 98017  
DEC Spill #: 982375  
UST Facility ID #: 1687

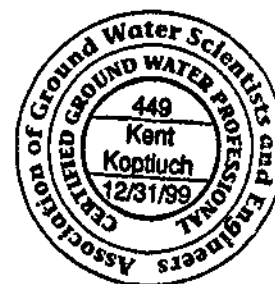
### Prepared For:

Mr. Kerney Brown  
Route 100, Box 15  
Warren, Vermont 05674

### Submitted by:

KENT S. KOPTIUCH, Inc.  
Geo-Environmental Services  
164 Osgood Hill  
Essex, Vermont 05452

Date: October 26, 1998



### Prepared By:

*John C. Roman*

John C. Roman  
Environmental Scientist

### Reviewed By:

*Kent S. Koptiuch*

Kent S. Koptiuch, CGWP #449  
President  
Principal Hydrogeologist

KSKGeoS™

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1	Boring and Well Completion Logs
2	Laboratory Chemical Analytical Results - August 20, 1998 Groundwater Sampling Event

## 1.0 INTRODUCTION

### 1.1 Authorization and Site Description

On July 28, 1998, KENT S. KOPTIUCH, Inc. Geo-Environmental Services (KSKGeoS™) was authorized by Mr. Kerney Brown to conduct a phase II subsurface hydrogeologic investigation upon a property he owns located on Route 100 in Warren, Vermont. KSKGeoS™' workplan to conduct this investigation was approved by Mr. Robert Butler of the Vermont Agency of Natural Resources Department of Environmental Conservation Waste Management Division's Sites Management Section (SMS) on August 10, 1998.

The site is located on the east side of Route 100 approximately 2/10 of a mile south of the Sugarbush Access Road in Warren, Vermont. Figure 1 is a *Site Location Map* depicting the facility's relative geographic location and its topographic setting. The site is currently occupied by the Sugarbush Service Station, consisting of a single story auto repair shop with office and storage space. The lot size is approximately 1.0 acre and is irregularly shaped.

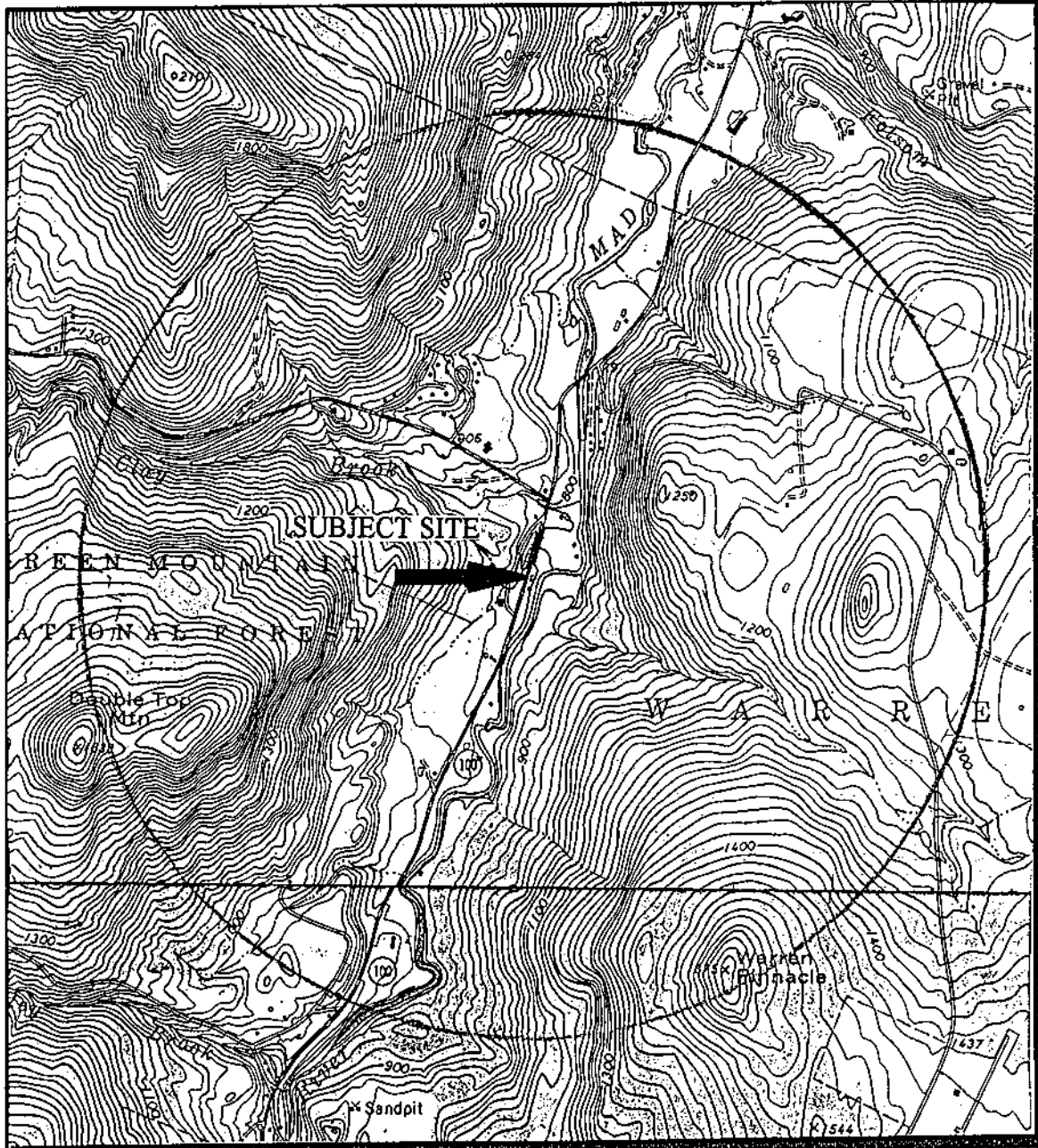
This investigation was initiated, as requested in a June 14, 1998 letter from Mr. Chuck Schwer of the SMS, to address concerns of possible groundwater and/or soils impact at the site by petroleum hydrocarbons associated with three (3) gasoline underground storage tanks (USTs) recently removed from the site.

### 1.2 Historical Background

According to Mr. Brown, the site is approximately 20 years old and was initially developed specifically as an automobile repair facility. At the time of the site's development, the lot was extended to the south and east with fill. This increased the grade of the lot in these areas by as much as 3.0 feet. In 1984, two (2) USTs (one 3,000 gallon and one 6,000 gallon) were installed north of the garage, and in 1987 an additional 6,000 gallon gasoline UST was added at the station; all of the USTs were utilized as storage for the retail sale of gasoline.

On April 30, 1998, all three (3) gasoline USTs were closed by removal. The tank closure assessment was conducted by Griffin International (Griffin) of Williston Vermont. According to Griffin's May 4, 1998 Assessment Report the tank pit soils were found to be impacted by volatile organic compounds (VOCs). Ground water was observed in the tank pit excavation at approximately 10.5 feet below-grade (BG). VOC impact, as measured by Griffin with a photoionization detector (PID) ranged from non-detectable levels (0.0) in parts per million (ppm) to 290 ppm. Soil samples screened for VOCs were obtained at depths ranging from 1.5 BG feet to 11.0 feet BG. Soil samples obtained at or below the apparent ground water depth of 10.5 feet BG ranged from non-detect to 56.0 ppm. Ground water samples obtained from two of six drilled monitoring wells located adjacent to the tank pit revealed 0.2 ppm by PID head-space analysis.

Figure 1  
Site Location Map



**SOURCES:**  
Waitsfield Quadrangle, Vermont 7.5 Minute Series (Topographic) U.S.G.S. Reston, VA 1970  
Warren Quadrangle, Vermont 7.5 Minute Series (Topographic) U.S.G.S. Reston, VA 1970

Griffin's project engineer, Mr. Erik Sandblom, indicated that the USTs were found to be in satisfactory condition with no significant pitting or holes observed. Soil samples obtained during the closure of the pump island, also completed by Griffin on April 30, 1998, revealed VOC impact of 110 ppm and 115 ppm from samples taken at 1.5 feet and 2.0 feet below the pump island respectively. All soil removed during the April 30, 1998 tank closure event was returned to the excavation as backfill. No replacement UST fuel systems are proposed for the site by Mr. Brown.

### **1.3 Goals**

KSKGeoS™ developed this investigation to meet the following goals:

- To assess the current environmental conditions in the overburden soils and in the unconsolidated groundwater aquifer by defining the extent and concentrations (if any) of separate-phase and/or dissolved-phase petroleum hydrocarbon product plume(s).
- To identify and evaluate impacts (if any) to identified potential receptors in the vicinity of the site, and;
- To identify a potential remedial action program or future monitoring program suitable to address identified impacts (if any) revealed through the course of this investigation.

### **1.4 Scope of Work**

KSKGeoS™'s scope of work on this site included the completion of the following tasks:

- A file search of Vermont Agency of Natural Resources Department of Environmental Conservation (DEC) records at the Waste Management Division's Sites Management Section in Waterbury, Vermont.
- Preparation of a site-specific health and safety plan (HASP) in accord with OSHA 29 CFR 1910.120.
- Field identification of potential receptors proximal to the site, including but not limited to: potable water supply sources, surface waterbodies and waterways, sensitive environmental areas, basement and crawlspace air quality in on-site and adjacent buildings, and possible preferential subsurface migratory pathways.
- Completion with professional oversight of four (4) soil borings by hollow stem auger drilling methods with three (3) of these borings finished as two (2) -inch diameter groundwater monitoring wells (MW-1, MW-2, and MW-3).
- Split-barreled (split spoon) sampling of the overburden soils during soil boring activities in accord with ASTM standard D1586. All samples were screened for VOCs, using jarred head-space methodology, with an H-Nu PI-101, 10.2 electron-volt (eV) lamp, photoionization detector (PID).
- The pre-existing monitoring wells located in the former UST pit area were evaluated for integrity.
- Survey of groundwater monitoring well locations (new and pre-existing) and elevations to an assumed datum. Elevational accuracy is  $\pm 0.01'$ ; spatial accuracy is  $\pm 1.0'$ .
- Gauging of groundwater elevations of all wells in the monitoring well network.
- Sampling of groundwater from wells MW-1, MW-2, MW-3, and MW-6 under chain-of-custody protocol. Field blank samples were also secured.
- Sampling of the on-site potable well (PW-1).
- Laboratory chemical analysis of groundwater and potable well samples for benzene, toluene, ethylbenzene, and total xylenes (BTEX); methyl tert-butyl ether (MTBE); 1,3,5-trimethylbenzene; 1,2,4 trimethylbenzene; and naphthalene by EPA method 8021b.

- Laboratory chemical analysis of groundwater and potable well samples for total petroleum hydrocarbons (TPH) by modified EPA Method 8015.
- An inspection of the Vare Realty property (upstream, southern adjoiner) to assess the potential for impact between the properties (a spill occurred on the Vare property in the Spring of 1998 due to flooding of the Mad River; the building's above-ground fuel oil tank was overturned. An emergency cleanup, consisting of excavating and drumming contaminated soils beneath the building's crawl-space was conducted by a State contractor).
- Hand-augering in the wooded area to the north of the study site to evaluate overburden conditions beyond the former UST area.
- Data evaluation and interpretation.
- Summary report preparation including all investigative results, documentation, interpretation, and findings and recommendations.

Figure 2 is a site map showing property layout, with groundwater monitoring well locations, and groundwater contours on August 20, 1998.

## **2.0 INVESTIGATIVE METHODOLOGY**

### **2.1 Soil Boring & Groundwater Monitoring Well Installation**

Boring and well installations at the site were completed on August 14, 1998. All monitoring well locations were selected by KSKGeoS™ supervising scientist John Roman. Monitoring well locations were sited to best represent the overburden and groundwater conditions on a site-wide basis. Soil borings and wells were completed by Tri-State Drilling & Boring of West Burke, Vermont under the direct supervision of Mr. Roman.

A Mobile B-57, truck-mounted drill rig, equipped with 4¾" inside diameter (ID) hollow stem augers was utilized for boring and well installations. The wells are constructed of 2" diameter, flush-threaded PVC screening and casing. Screening is factory slotted to 0.010' (an equivalent of 0.010 -feet of opening per running foot of screen). The screened interval for each well was determined by the supervising hydrogeologist to extend at least five (5) feet above and five (5) feet below the groundwater table, where possible, to allow for seasonal fluctuations.

The annulus of each borehole was then filter-packed with washed, #1 Morie sand to a depth at least one (1) foot above the top of the screened interval. A one (1) foot (or greater) hydrated bentonite seal was emplaced above the filter-pack. The remainder of the annular space was then backfilled with clean cuttings from each borehole. The top of each well casing was secured with a gripper-type cap. All three (3) wells were completed with flush-mounted, steel manholes set in concrete pads. Boring and well completion logs are included as **Attachment 1**.

Upon completion, each well was developed by hand through repetitive bailing. Well top-of-casing elevations were surveyed in on August 20, 1998 by Mr. Roman and Mr. Kent Koptiuch to an assumed datum of 100.00 -feet; The top of the concrete slab in front of the north door of the station building was used as a benchmark.

For areas inaccessible to the drill rig, a stainless steel, hand-operated, bucket-auger with a 6 inch diameter by 12 inch deep spoon, was utilized to complete soil investigation. No monitoring wells were installed within borings completed by hand augur during this investigation.

SUMMARY TABLE 1: GROUNDWATER ELEVATIONS (in feet) - August 20, 1998						
WELL	GRADE	TOP-OF-CASING	SCREENED INTERVAL	DEPTH-TO-BOTTOM (BG)	DEPTH-TO-WATER	WATER ELEVATION
MW-1	99.61	99.32	85.78-95.78'	13.83	10.19	89.13
MW-2	98.57	98.36	84.96-94.96'	13.61	9.86	88.50
MW-3	98.40	98.09	87.59-95.59'	10.81	9.69	88.40
MW-4	99.11	98.40	unknown	14.02	9.51	88.89
MW-5	99.11	99.03	unknown	15.02	10.32	88.71
MW-6	99.05	98.15	unknown	14.33	9.72	88.43
MW-7	99.32	99.36	unknown	11.18	10.32	89.04

Table 1 Notes:

- 1) Benchmark: Top of concrete slab in front of north station doorway.
- 2) Monitoring Wells MW-4 through MW-7 are four of an apparent six pre-existing wells which are located within or just adjacent to the UST pit. The two other pre-existing monitoring wells could not be located.
- 3) Pre-existing Monitoring well MW-7 is a 4 inch PVC well with top of casing extends above grade due to ground surface settling; all other wells are constructed of two-inch PVC and are below grade.

## 2.2 Soil Sampling and Field Analysis

Soil boring samples were secured with a two-inch (2") outside diameter split-barreled sampler (split-spoon), advanced with the aid of a 140 pound drop hammer, in conformance with ASTM Standard D1586. Sampling was conducted at continuous intervals beginning at-grade for initial boring activities and then, on average, at every 5.0 foot interval. During hand auguring soil samples were obtained at between 6 inch and 1 foot intervals.

Split-spoons were decontaminated after each sample was collected with a double-rinse, liquinox-clean water solution and clean water. Similarly, the hand augur head and rod were also decontaminated in similar fashion between holes. All samples were classified by the supervising ground water scientist using the Unified Soil Classification System.

Each soil sample was screened for the presence of VOCs by PID using bagged, head-space methodology. The PID employed was an H-Nu PI-101 with a 10.2 eV lamp. The unit was calibrated on-site for benzene in calibration gas equivalents (CGEs) of 100% isobutylene at 70 parts per million (ppm).

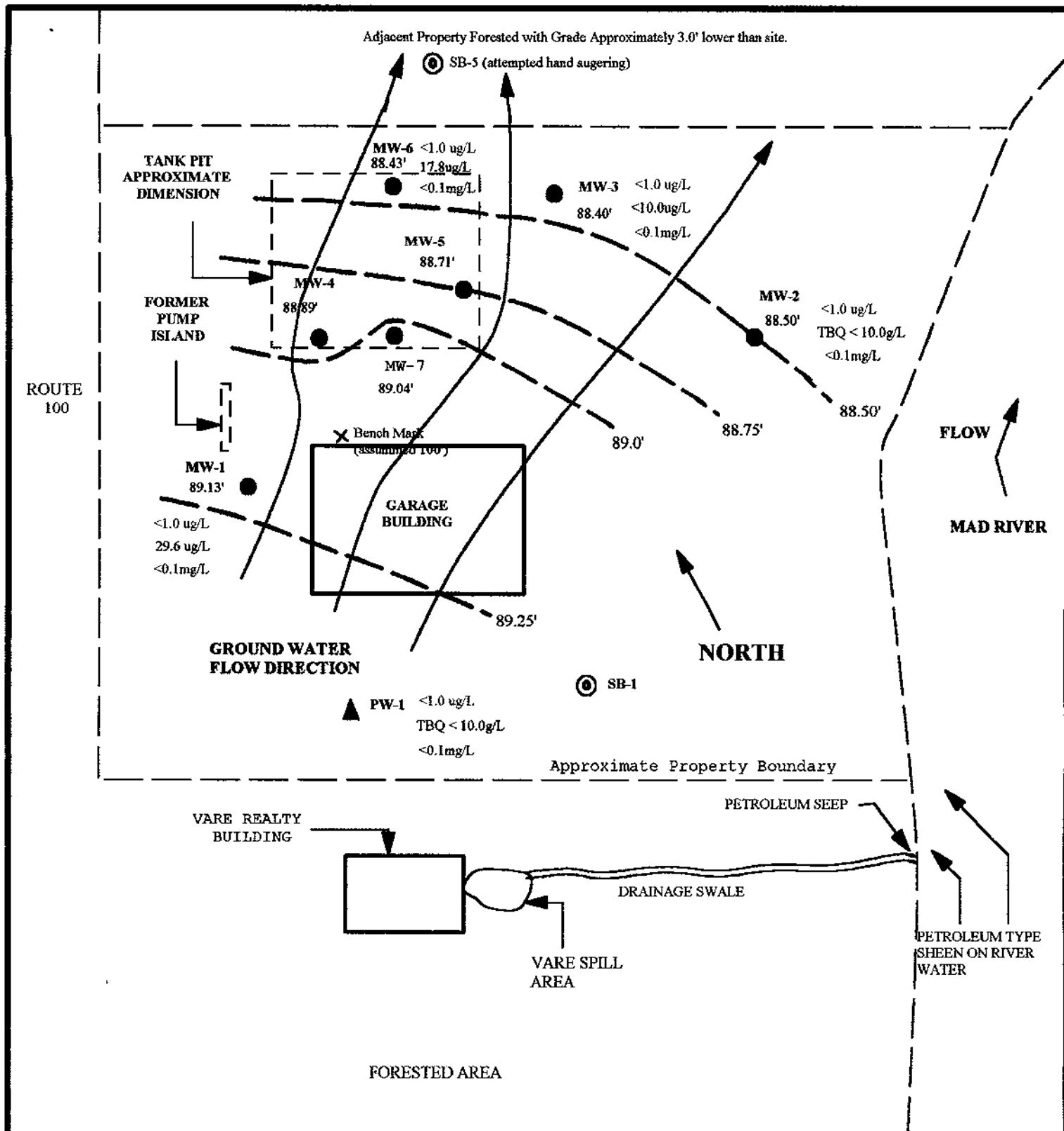
## 2.3 Groundwater Monitoring, Sampling, and Analysis

Following the survey, on August 20, 1998, an optical interface probe, capable of determining groundwater and separate-phase hydrocarbon petroleum product presence and thickness to within 0.01', was utilized to profile the elevations and the VOC characteristics of the overburden aquifer within each well. Table 1 is a summary of groundwater elevations for the August 20, 1998 gauging event.

Water volumes were then calculated for each of the four (4) wells to be sampled, and the equivalent of three (3) well volumes were purged, by bailing, prior to sampling. Groundwater samples and a field blank were then secured under chain-of-custody protocol. The on-site potable well (PW-1) was also sampled via a sink faucet within the garage.

The sampling bailer was decontaminated between each well utilizing a liquinox-distilled water solution followed by a distilled water rinse. All samples were packed on ice and hand-delivered to Endyne, Inc. Laboratory Services (Endyne) in Williston, Vermont that afternoon. Table 2 is a summary of the laboratory chemical analytical results for ground water samples obtained on August 20, 1998. The actual





**FIGURE 2**

Groundwater Contour Map  
With BTEX, MTBE & TPH  
Concentrations

KENT S. KOPTIUCH, Inc.  
Geo-Environmental Services  
164 Osgood Hill, Essex, Vermont 05452  
(802) 878-1620

**PROJECT INFORMATION**

CUSTOMER: MR. KERNEY BROWN  
PROJECT: SUGARBUSH SERV. STAT.  
PROJECT #: 98017  
LOCATION: WARREN, VERMONT  
DEC SPILL#: 98-2375  
DATE: 10/26/98  
DRAWN BY: JOHN C. ROMAN  
SCALE: 1" = 30' (APPROX)

**EXPLANATION**

POTABLE WELL PW-1 ▲  
MONITORING WELL: MW-1 ●  
SOIL BORING: SB-1 ⊙  
WATER ELEVATION: 96.00'  
DISSOLVED BTEX: <1.0 ug/L  
DISSOLVED MTBE: <10.0 ug/L  
TPH CONCENTRATIONS: <0.1 mg/L  
GROUNDWATER CONTOUR: 89.0' ———

SUMMARY TABLE 2 - 8/20/98 LABORATORY CHEMICAL ANALYTICAL RESULTS										
WELL	MTBE µg/L	Benzene µg/L	Toluene µg/L	Ethyl- benzene µg/L	Xylenes µg/L	Total BTEX µg/L	1,3,5 Tri- Methylbenzene µg/L	1,2,4 Tri- Methylbenzene µg/L	Naphthalene µg/L	TPH mg/L
MW-1	29.6	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<0.10
MW-2	TBQ <10.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<0.10
MW-3	<10.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<0.10
MW-4	<10.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<0.10
MW-6	17.8	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<0.10
PW-1	TBQ <10.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<0.10

Table 2 Notes:

- 1) Volatiles analyzed by EPA Method 8021B
- 2) Total Petroleum Hydrocarbons (TPH) analyzed by EPA Method 8015 quantitated based upon the response of gasoline.
- 3) TBQ; Trace Below Quantitation Limit

laboratory chemical analytical report prepared by Endyne is included as **Attachment 2**.

Laboratory chemical analyses was completed by Endyne in accordance with EPA Method 8021b and with modified EPA method 8015. Method 8021b is utilized to identify benzene, toluene, ethylbenzene, and total xylene constituents (BTEX); 1,2,4 Tri-methylbenzene; 1,3,5 Tri-methylbenzene; Naphthalene; and MTBE. The modified EPA Method 8015 is utilized for total petroleum hydrocarbon (TPH) concentrations.

## 2.4 Potential Receptor Survey

A physical survey was conducted to identify potential receptors, including surface waterbodies, potable water sources, neighboring or on-site basements and/or crawl-spaces, sensitive environmental areas, and likely routes of subsurface conductance.

In addition, a review of the SMS' Vermont Hazardous Sites List was completed to identify any known spill sites in close proximity to the study site.

## 3.0 RESULTS

### 3.1 Geologic, Overburden Lithologic, Geomorphologic, and Hydrogeologic Summary

The site is located in the Town of Warren Vermont within the Mad River Basin at approximately 800-feet above mean sea level. Topography at the site generally slopes with a northeasterly gradient of less 1%, eventually draining into the Mad River. Overall regional surficial drainage is also to the northeast via the Mad River Valley basin to its confluence with the Winooski River approximately 14 miles north-northeast of the site.

Surficial soils at the site and in the general vicinity along this river basin are mapped as kame terraced outwash gravel deposition (Stewart, 1973) representing both fluvial and modern day alluvial river bottom sediments of this primary drainage basin system. KSKGeoS™ boring activities revealed coarse to medium sands with fine-to-medium gravels intercepting fine sands and trace silt and clay at 14 feet BG.

Split-spoon samples from SB-1 did not reveal any detectable VOCs by PID through boring completion at

18 feet BG. Borings completed for MW-1, MW-2 and MW-3 revealed only trace level VOCs ranging from 0.2 PPM to 0.6 PPM at variable depths ranging from just below ground surface (1.0 to 3.0 feet BG) to depths at or near the groundwater interface at 9.0 - 11.0 feet BG. Field observations did not note any petroleum odor or staining during this investigation.

An additional hand boring (SB-5) was attempted in the forested area directly down gradient of the tank pit. This boring met refusal at approximately 2.0-feet BG in bank run cobble and gravel. PID headspace analysis of soil grab samples from this limited boring did not reveal any detectable VOCs, nor were any petroleum odors noted during this field work. Vegetation in this area appeared to be in good condition with no indication of stress which may be attributable to toxic effects of petroleum hydrocarbons.

Bedrock in the vicinity (not encountered during drilling at the site) is comprised of the Lower Ordovician period Mount Hamilton Formation (Doll, 1961) comprised of variably-colored slates interbedded with quartzite and limestone. This formation was confirmed by observation of this bedrock upon the river bank and in the river bed.

Four (4) wells were found in the vicinity of the former UST pit; these were re-named as MW-4, MW-5, MW-6, and MW-7. Of these, MW-6 was deemed still in a condition suitable for sampling. MW-4 and MW-7 are former tank-pit wells screened to the surface; both of their roadboxes were severely damaged and their integrity was questionable. The roadbox on MW-5 was also damaged to the point where we felt that sample results would not be representative of actual conditions.

There is a 14 -foot deep dug well (PW-1) located beneath the parking area on the south side of the station building. According to Mr. Brown, this well is constructed of concrete tiles set in a backhoe excavation. During installation they encountered only a small quantity of water in the overburden sands and gravels. A clay layer was intersected in the 12.0 to 14.0 -foot BG horizon. Below this a strong water-bearing gravel horizon was intersected. There is no access to the well from the surface and it could not be physically located except by approximation through Mr. Brown. This well is utilized for wash water in the station, but it is not used as a potable source.

### 3.2 Specific Hydrogeological Characteristics

Groundwater beneath the site was gauged at a depth of approximately ten (10) -feet BG on the August 20, 1998 sampling date. Groundwater flow direction is to the northeast across the site with an approximate gradient of 1%. An approximate rate-of-travel ( $V_a$ ) in the overburden aquifer was calculated through the application of Darcy's Law utilizing typical constants for horizontal hydraulic conductivity ( $K_H$ ) and porosity ( $n$ ) of the observed aquifer matrix (Driscoll, 1986):

$$V_a = \{[K_H (h_1 - h_2)] \div L\} \div n$$

where  $(h_1 - h_2)$  is the difference in hydraulic head, and  $L$  is the distance along the flowpath for which the difference in hydraulic head is measured. When all known and assumed aquifer characteristics are entered into the above equation, the resulting rate-of-travel from MW-3 to MW-4 on September 2, 1998 is:

$$V_a = \{[10 \text{ gpd/ft}^2 (89.13' - 88.43')] \div 75'\} \div 30\% = 2.8 \times 10^{-2} \text{ gpd/ft}^2$$

Table 1 is the groundwater elevation data calculated from the gauging of the monitoring well network on August 20, 1998. Figure 2 depicts groundwater contours of the overburden aquifer based upon this data.

### 3.3 Groundwater Laboratory Chemical Analytical Results

Actual laboratory chemical analytical results for all analytes are included as Attachment 2 of this report. Table 2 summarizes the results of these analyses. Samples were secured from four (4) monitoring wells and one (1) potable well, along with a field blank for quality control purposes.

- All water samples obtained from the site were laboratory analyzed by EPA Method 8021B and found to be below the method detection limit (MDL) of 1.0 µg/L for BTEX, Tri-methylbenzenes, and Naphthalene constituents. Methyl-tert butyl ether (MTBE) was detected in samples obtained from MW-1 at 29.6 µg/L and in MW-6 at 17.8 µg/L. Also, a trace of MTBE below the MDL was picked up in the sample from PW-1 and MW-2.
- A second set of water samples obtained the site were laboratory analyzed by modified EPA Method 8015 for total petroleum hydrocarbons. The results of these analyses yielded no analyte concentrations above the MDL of 0.1 milligrams per liter (mg/L).
- The field blank samples yielded no analyte concentrations above the MDLs.

### 3.4 Potential Environmental Concerns

#### 3.4.1 Site Specific Concerns

The Sugarbush Garage operates as a automobile repair shop. The shop was observed to be well kept. The limited occurrence of cleaning fluids, lubricants, or other fluids maintained for the operation were found to be properly stored and containerized. According to Mr. Brown, his waste oils/fluids are properly containerized and routinely picked-up monthly and processed by Safety Kleen of Barre, Vermont. According to Mr. Brown there are no floor drains through the concrete slab of his garage and none were observed.

#### 3.4.2 Surrounding Land Uses

Surrounding land uses were noted as follows:

- North -Forested, with (original) grade which is approximately 3.0-feet lower than the site's grade. The property is owned by a part-time resident whose dwelling is located approximately 800 feet south on the opposite side of an unnamed tributary of the Mad River which flows West to East off of the eastern slopes of Double Top Mountain,
- East -(across Route 100) vacant, undeveloped, forested land,
- South -Vare Realty; currently closed and abandoned due to the early August 1998 flooding.
- West -The boundary of this site is the Mad River. Across the river the terrain is forested and undeveloped

#### 3.4.3 Site Utilities

As noted above, the site is currently supplied by an on-site tiled well located approximately 30 feet off the southwest corner of the station building. According to Mr. Brown this water source is not currently used for drinking purposes. The site also contains its own septic system with an associated leech field located off of the northeast corner of the station building. Mr. Brown is not aware of any problems with this septic system and field observations did not note any evidence of leech field failure.

#### 3.4.4 Potable Water Sources - 1 Mile Radius of Site

A tiled, dug-well exists on site. Analytical results of water obtained from this well for this investigation did not reveal detectable analytes associated with VOC impact with the exception of a trace of MTBE below the MDL. Groundwater is shown to flow to the north-northeast and away from this site well which is also located south and upgradient of the supposed source area. Another water well exists upon the Vare Realty property, approximately 250 feet from the source area but is also upgradient of the UST pit of Sugarbush Station. There are also several residences down gradient of the site and likely rely upon gravel or bedrock wells for their potable water supply, but these homes are on the opposite side of a tributary stream to the Mad River located approximately 700 feet to the north of the site.

### 3.4.5 Other Identified Sensitive Receptors - 1 Mile Radius of Site

Sensitive receptors within a one mile radius of the site, include soils, bedrock, and groundwater, as well as the Mad River, which flow adjacent to the site in a northerly direction veering northeasterly as it passes the northeastern corner of the site. The river bank was carefully investigated for the evidence of petroleum seep. Although no seeps could be found along the gravelly banks representing the eastern boundaries of the site, a petroleum seep was noted on the adjacent river bank of the Vare Realty property. This seep is the confluence of a drainage swale entering the river from the general direction of the rear of this Realty building (see Figure 2). According to Mr. Brown, Vare Realty was severely effected by recent flood waters which up-ended an above-ground, basement-type fuel oil tank. According to Mr. brown, the VT DEC responded to this spill. In a telecom with Mr. Chuck Schwer of the VT DEC, the Department has contracted with an environmental consultant who is currently investigating and monitoring this spill.

### 3.4.6 Hazardous Sites Review/Identification

A review of the Vermont WMD hazardous waste site listing identified four (4) sites within one (1) -mile of the study site. These sites are all hydraulically downgradient of the study site and/or are associated with drainage basins that are not likely hydrogeologically connected to that of the site. The list of identified hazardous sites within one mile of the study site is as follows:

- |                |                           |                       |            |
|----------------|---------------------------|-----------------------|------------|
| • Site #870103 | Sugarbush South           | Sugarbush Access Road | Warren, VT |
| • Site #900561 | Top Gas                   | Route 100             | Warren, VT |
| • Site #931447 | Kingsbury Service Station | Route 100             | Warren, VT |
| • Site #972132 | Sugarbush North           | Mt. Ellen             | Warren, VT |

As noted above the incidence of a heating fuel oil spill upon the Vare Realty Property directly upgradient and to the north of the site does present the possibility that the Sugarbush Station could be a potential receptor of that spill. According to a telecom with the VT DEC of October 22, 1998 the Vare Realty site is still under investigation and being monitored, but has not as of October 22, 1998 recieved a hazardous site number. KSKGeoS™ investigation of the Sugarbush Station, which included a soil boring within the southeastern portion of the station lot, and potable well sampling, has not revealed the presence of VOC impact that maybe associated with the adjacent spill.

## 4.0 FINDINGS

KENT S. KOPTIUCH, Inc. Geo-Environmental Services' phase II subsurface investigation at the Sugarbush Service Station property, located on Route 100 in Warren, Vermont yielded the following results and findings:

- The overburden aquifer is comprised primarily of sand and gravels associated with glacial-fluvial processes and modern day river deposition. The groundwater table was noted at a depth of approximately 10 -feet below grade at the time of this investigation.
- Groundwater flow conditions in the overburden aquifer exhibit a northeasterly flow direction across the site. Gradient is approximately 1 % with a rate-of-travel through the overburden aquifer of approximately  $2.8 \times 10^{-2}$  gpd/ft<sup>2</sup>.
- Laboratory chemical analytical results of the groundwater samples secured from three new monitoring wells, one (1) existing monitoring well, and the on-site potable well did not reveal BTEX constituents, naphthalene, 124-trimethylbenzene or 135-trimethylbenzene above the EPA 8021b method detection limit of 1.0 ug/l. MTBE was detected in ground water obtained from MW-1 (29.6 µg/L); this well is located up gradient of the tank pit and adjacent to the former pump island. MTBE was also detected in ground water obtained from MW-6 (17.8 µg/L), a pre-existing well located within or directly next to the southern and downgradient edge of the former tank pit. These MTBE

KSKGeoS™

concentrations are below the Vermont Groundwater Enforcement Standard (GES) of 40 µg/L, however, in the instance of MW-1 levels of MTBE do exceed the VT DEC Preventative Action Level (PEL) of 20 µg/L. Also, a trace of MTBE below the MDL (10 µg/L) was picked up in ground water samples from PW-1 and MW-2.

- The results of this Subsurface Hydrologic Investigation suggests the site is not significantly impacted by dissolved petroleum hydrocarbons at concentrations that pose a threat to human health, life, or safety, or to environmental safety. The low level of MTBE revealed at this site is likely attributable to a combination of former UST system existence and the ancillary effects of small spills of gasoline over time as might be typical of any auto repair facility, particularly one which also conducted retail sales of gasoline.
- Residual MTBE impact is below GES and will likely attenuate in quick order given the high porosity and well-aerated nature of the overburden soils.
- This investigation has revealed the presence of an on-site potable well system which although not used for a source of drinking water, can potentially act as a draw-down point and potentially influence residual MTBE associated with the site into its capture zone.
- A review of identified and VT DEC listed hazardous sites within one mile radius of the site did not identify any risk to the site from these known spill sources. Vare Realty, an abutting property to the south, had experienced a spill of fuel oil associated with the July, 1998 flood of the Mad River Valley. During KSKGeoS™'s investigation of the Sugarbush Service Station it was revealed that the spill associated with the Vare Realty building appears to have been significant enough to have caused a petroleum seep into the Mad River via a drainage swale just south of the Sugarbush Service Station property boundary. The effect of this spill upon the Sugarbush Service Station potable well remains an unknown risk given the very permeable substrata identified during this investigation. Subsurface borings and ground water sampling completed for this investigation did not reveal the existence that this off-site contamination has yet impacted the site or the potble well associated with it..

## **5.0 RECOMMENDATIONS**

Based upon the findings of this subsurface investigation, KSKGeoS™ offers the following recommendations regarding future monitoring and/or remedial options for the Sugarbush Service Station property:

- The contaminant effects of the UST system formally located at the Sugarbush Service Station appears to be residual in nature and will likely attenuate naturally in quick order. KSKGeoS™ does not feel any further investigation is warranted and that the degree and extent of contamination has been adequately delineated.
- The potable well water source associated with the site should not be utilized for drinking water. This well should continue to be monitored via sample analysis to evaluate trends in MTBE concentrations, and for the purpose of monitoring any potential impact to this well from the upgradient and off-site spill identified during this investigation. Recommended sampling frequency is quarterly. The recommended analysis is EPA method 8021b.

## **6.0 LIMITATIONS**

This report is based upon limited physical investigation of the site and vicinity, samples from a fixed number of groundwater monitoring wells and sampling points, laboratory chemical analyses, and research of materials and files available at the time of the investigation. The findings presented in this report are based only on the observations drawn during this investigation, and upon data provided by others. This report presents a description of the subsurface conditions, in the overburden lithology at each sampling

In performing its professional services, KSKGeoS™ employs the degree of care and skill exercised under similar circumstances by members of the environmental profession practicing in the same or similar locality under similar conditions. The standard of care shall be judged exclusively as of the time these services are rendered, and not according to later standards. KSKGeoS™ makes no express or implied warranty beyond its conformance to this standard.

KSKGeoS™ shall not be responsible for conditions or consequences arising from relevant facts that were concealed, withheld, or not fully disclosed for the preparation of this document. KSKGeoS™ believes that all information contained in this document is factual, but no guarantee is made or implied.

## **7.0 REFERENCES**

- Department of Environmental Conservation, **Chapter 12 - Groundwater Protection Rule and Strategy**, Vermont Agency of Natural Resources, Rule #97-P14, effective November 15, 1997.
- Domenico, Patrick A. and Franklin W. Schwartz, **Physical and Chemical Hydrogeology**, John Wiley & Sons, New York, New York 1990
- Driscoll, Fletcher G., Ph.D., **Groundwater and Wells, 2<sup>nd</sup> ed.**, Johnson Division, St. Paul, MN., 1986.
- Doll, Charles G., ed., **Centennial Geologic Map of Vermont**, Vermont Geological Survey, Montpelier, VT, 1961.
- Stewart, David P. and Paul MacClintock, **The Surficial Geology and Pleistocene History of Vermont**, Vermont Geological Survey and Vermont Water Resources Department, Montpelier, VT, Bulletin No. 31, 1969.
- Stewart, David P. and Paul MacClintock, **The Surficial Geologic Map of Vermont**, Vermont Geological Survey, Montpelier, VT, 1970.
- United States Geological Survey, **Waitsfield Quadrangle, Vermont 7.5 Minute Series (Topographic)**, Reston, VA., 1970.
- United States Geological Survey, **Warren Quadrangle, Vermont 7.5 Minute Series (Topographic)**, Reston, VA., 1970.
- Waste Management Division, **Second Quarter 1998 Update, Vermont Hazardous Sites List**, Vermont Agency of Natural Resources Department of Environmental Conservation, Waterbury, VT., July 6, 1998.

**Attachment 1**

**Soil Boring and Well Completion Logs**





**KENT S. KOPTUCH, INC.**  
 Geo-Environmental Services  
 164 OSGOOD HILL • ESSEX, VERMONT 05452  
 TELE/FAX (802) 878-1620

**BORING LOG SB-1** (PG 1 OF 2)  
 INSTALLED: AUGUST 14, 1998  
 LOGGED BY: JOHN C. ROMAN

**PROJECT # 98017**

**SUGARBUSH SERV. STATION**

**DRILLING COMPANY**

**TRI-STATE DRILLING**

**DRILL RIG:**

**MOBILE B-57, 4 1/4 ID HSA**

**SAMPLING METHOD:**

**SPLIT-SPOON & GRAB**

PREDOMINANT LITHOLOGY

ASPHALT OR CONCRETE	GRAVEL / COARSE FILL	COARSE SAND / FINE GRAVEL	LOAM / LM SND	MEDIUM SAND	
FINE SAND	FINE SILT SAND	SILT-CLAY	CLAY	BASAL TILL	BEDROCK

DEPTH (ft)	CONSTRUCTION	SAMPLE #	BLOWS/ft	RECOVERY	VOCs in ppm	SOILS/LITHOLOGY	COMMENTS
— 0.0 —		GRAB			0.0	BROWN LOAM, MEDIUM SAND W/SOME MED & FN GRAVEL	GRADE @ 99.61' TOC @ 99.32' 0.0' - 2.0'
— 1.0 —							
— 2.0 —		GRAB			0.0	COARSE GRAVEL WITH SOME CRS TO MED SAND	2.0' - 3.0'
— 3.0 —		SS-1 (3-5')	10 FOR 2"	0.0'	0.0	ENCOUNTER TIRE IN THE SUBSURFACE - DRILL THROUGH	3.0' - 3.16'
— 4.0 —							
— 5.0 —		SS-2 (5-7')	5-13-11-14	1.08'	0.0	COARSE TO MEDIUM SAND, FINE GRAVEL, TRACE SILT, DRY.	5.0' - 6.08'
— 6.0 —							
— 7.0 —		SS-3 (7'-9')	26-13-12-16	0.92'	0.0	DARK OLIVE CRS & V. CRS SAND, SOME SILT & V. FINE GRAVEL.	7.0' - 7.92' WT @ 7.75
— 8.0 —							
— 9.0 —		GRAB			0.0	ADVANCE THROUGH COBBLES AND FINE GRAVEL	9.0' - 10.0'
— 10.0 —		SS-4 (10-12')	13-11-12-5	0.92'	0.0	OLIVE GRAY SAND & FINE ROUNDED GRAVEL; WET COARSE SAND WITH FINE GRAVEL; SATURATED / MOTTLED	10.0' - 10.5' 10.5' - 10.92'
— 11.0 —							
— 12.0 —		SS-5 (12-14')	3-3-7-7	0.92'	0.0	COARSE AND V. COARSE BROWN SAND W/ GRAVEL	12.0' - 14.0'
— 13.0 —							
— 14.0 —		SS-6 (14-16')	4-5-8-6	1.66'	0.0	FINE TO COARSE SAND W/ TRACE SILT WET, LOOSE GREY UNIFORM CLAY; MOIST VERY FINE SAND WITH SILT; MOIST	14.0' - 14.50' 14.50' - 15.16' 15.16' - 15.66'
— 15.0 —							



**KENT S. KOPTIUCH, INC.**  
**Geo-Environmental Services**  
 164 OSGOOD HILL • ESSEX, VERMONT 05452  
 TELE/FAX (802) 878-1620

**BORING LOG SB-1** (PG 2 OF 2)  
 INSTALLED: AUGUST 14, 1998  
 LOGGED BY: JOHN C. ROMAN

**PROJECT # 98017**

**SUGARBUSH SERV. STATION**

**DRILLING COMPANY**

**TRI-STATE DRILLING**

**DRILL RIG:**

**MOBILE B-57, 4 1/4 ID HSA**

**SAMPLING METHOD:**

**SPLIT-SPOON & GRAB**

PREDOMINANT ☒ ASPHALT OR CONCRETE ☒ GRAVEL / COARSE FILL ☒ COARSE SAND / FINE GRAVEL ☐ LOAM / LM SND ☐ MEDIUM SAND  
 LITHOLOGY ☒ FINE SAND ☒ FINE SILT SAND ☒ SILT-CLAY ☒ CLAY ☒ BASAL TILL ☒ BEDROCK

DEPTH (ft)	CONSTRUCTION	SAMPLE #	BLOWS/4'	RECOVERY	VOCs in ppm	SOILS/LITHOLOGY	COMMENTS
— 16.0 —		SS-07(16-18')	3-4-4-3	2.0'	0.0	OLIVE SILT-SAND & FINE SAND W/ SOME CLAY; WET	16.0' - 16.66'
— 17.0 —						GREY V. FINE SAND W/ SILT; V. MOIST	16.66' - 17.16'
— 18.0 —						OLIVE-GREY SILT-CLAY; UNIFORM, STICKY AND MOIST.	17.16' - 18.0'
— 19.0 —	END OF BORING 18.0'						E.O.B. @ 18.0'
— 20.0 —							
— 21.0 —							
— 22.0 —							
— 23.0 —							
— 24.0 —							
— 25.0 —							
— 26.0 —							
— 27.0 —							
— 28.0 —							
— 29.0 —							
— 30.0 —							



**KENT S. KOPTIUCH, INC.**  
 Geo-Environmental Services  
 164 OSGOOD HILL • ESSEX, VERMONT 05452  
 TELE/FAX (802) 878-1620

# WELL LOG MW-1

INSTALLED: AUGUST 14, 1998

LOGGED BY: JOHN C. ROMAN

PROJECT # 98017

SUGARBUSH SERV. STATION

DRILLING COMPANY

TRI-STATE DRILLING

DRILL RIG:

MOBILE B-57, 4 1/4 ID HSA

SAMPLING METHOD:

SPLIT-SPOON & GRAB

BENTONITE WELL SEAL  
 CONCRETE SURFACE SEAL

NATIVE BACKFILL

#0 MORIE SAND PACK

CASING: 2" DIAM., FLUSH-THREADED PVC  
 SCREEN: 2" DIAM., FLUSH-THREADED, 0.20" SLOT PVC  
 SCREENED INTERVAL: 85.78' - 95.78'

DEPTH (ft)	CONSTRUCTION	SAMPLE #	BLOWS/ft	RECOVERY	VOCs in ppm	SOILS/LITHOLOGY	COMMENTS
0.0							GRADE @ 99.61'
		GRAB			0.4	ASPHALT OVER DRY, GREY-BROWN, SANDY GRAVEL	TOC @ 99.32'
-1.0		GRAB			0.4	SAND W/ FINE TO MED GRAVEL (FILL)	0.0' - 1.0'
-2.0							1.0' - 2.0'
-3.0		GRAB			0.2	FINE AND MEDIUM COBBLE W/ SOME CRS & MED SAND	3.0' - 4.0'
-4.0							4.08' - 4.25'
-5.0		SS-1 (5-7')	3-2-2-4	1.0'	0.0	DRY COARSE TO MED BROWN SAND AND FINE GRAVEL	5.0' - 6.0'
-6.0							
-7.0							
-8.0		SS-2 (8-10')	REFUSAL	---	---	SPOON REFUSAL, BOUNCING ON ROCK ADVANCE TO 9.5'	- 0' -
-9.0							WT @ 9.25
-9.5		SS-3 (9.5-11.5')	11-12-12-28	0.66'	0.4	WET COARSE GRAY-BROWN SAND & MED GRAVEL W/ SOME FINE SAND, TRACE SILT	9.5' - 10.16'
-10.0							
-11.0							
-12.0							
-13.0		SS-4 (13-15')	20-17-19-23	0.83'	0.0	WET, GRAY-BROWN CRS & MED SAND W/ MED RND GRV WET FINE OLIVE SAND W/SOME SILT, TRACE MED CRS SAND	13.0' - 13.5' 13.5' - 13.83'
-14.0		GRAB			0.0	WET FINE TO MED COBBLE W/ CRS & MED SAND	SET WELL @ 13.5'
-15.0						REFUSAL - END OF BORING	E.O.B. 14.5



**KENT S. KOPTIUCH, INC.**  
 Geo-Environmental Services  
 164 OSGOOD HILL • ESSEX, VERMONT 05452  
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# WELL LOG MW-2

INSTALLED: AUGUST 14, 1998  
 LOGGED BY: JOHN C. ROMAN

**PROJECT # 98017**

**SUGARBUSH SERV. STATION**

**DRILLING COMPANY**

**TRI-STATE DRILLING**

**DRILL RIG:**

**MOBILE B-57, 4 1/4 ID HSA**

**SAMPLING METHOD:**

**SPLIT-SPOON & GRAB**

BENTONITE WELL SEAL  
 CONCRETE SURFACE SEAL

NATIVE BACKFILL

#0 MORIE SAND PACK

CASING: 2" DIAM., FLUSH-THREADED PVC  
 SCREEN: 2" DIAM., FLUSH-THREADED, 0.20" SLOT PVC  
 SCREENED INTERVAL: 84.96' - 94.96'

DEPTH (ft)	CONSTRUCTION	SAMPLE #	BLOWS/4'	RECOVERY	VOCs in ppm	SOILS/LITHOLOGY	COMMENTS
0.0							GRADE @ 98.57'
							TOC @ 98.36'
0.0 - 1.0'		GRAB			0.0	DRY BROWN LOAMY SAND W/ FINE GRAVEL	
1.0 - 3.0'		GRAB			0.0	DRY CRS & MED SAND, SOME FN GRAVEL	
3.0 - 4.0'		GRAB			0.4	SLIGHTLY MOIST OLIVE AND & FINE RND GRAVEL	
5.0 - 5.5'		SS-1 (5-7')	13-14-7-8	0.5	0.2	DRY OLIVE FN-MED SAND W/ FN GRAVEL & BROKEN STONE	
9.0' - 9.5'		SS-2 (9-11')	9-8-16-18	1.08'	0.0	V. MOIST MED TO FN OLIVE SAND W/ SOME CRS SAND, BROKEN STONE, TRC SILT WET, AS ABOVE WITH MORE SILT	WT @ 9.50'
13.0' - 14.0'		GRAB			0.0	WET MEDIUM & FN COBBLE WITH SILTY SANDS	
14.0' - 14.66'		SS-3(14-16')	15-14-38 (8")	0.66	0.2	WET FINE SAND W/SOME CRS & MED SAND, MED ANGULAR GRAVELS, AND LITTLE SILT (SLIGHTLY STICKY) CLEAN-OUT TO 15.0' DIFFICULTY W/ RUNNING SANDS	SET WELL @ 13.50'



**KENT S. KOPTUCH, INC.**  
 Geo-Environmental Services  
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 TELE/FAX (802) 878-1620

# WELL LOG MW-3

INSTALLED: AUGUST 14, 1998  
 LOGGED BY: JOHN C. ROMAN

PROJECT # 98017

SUGARBUSH SERV. STATION

DRILLING COMPANY

TRI-STATE DRILLING

DRILL RIG:

MOBILE B-57, 4 1/4 ID HSA

SAMPLING METHOD:

SPLIT-SPOON & GRAB

BENTONITE WELL SEAL  
 CONCRETE SURFACE SEAL

NATIVE BACKFILL

#0 MORIE SAND PACK

CASING: 2" DIAM., FLUSH-THREADED PVC  
 SCREEN: 2" DIAM., FLUSH-THREADED, 0.20" SLOT PVC  
 SCREENED INTERVAL: 87.59' - 95.59'

DEPTH (ft)	CONSTRUCTION	SAMPLE #	BLOWS/ft	RECOVERY	VOCs in ppm	SOILS/LITHOLOGY	COMMENTS
0.0							GRADE @ 98.40'
							TOC @ 98.09'
0.0		GRAB			0.4	DRY BROWN LOAMY SAND W/ MED GRAVEL (FILL)	0.0' - 1.0'
1.0		GRAB			0.4	AS ABOVE W/ LESS GRAVEL	1.0' - 3.0'
3.0		GRAB			0.6	S. MOIST SAND, SOME GRAVEL AND LITTLE SILT	3.0' - 5.0'
5.0		SS-1 (5-7')	10-15-8-1	1.16'	0.2	S. MOIST BROWN SAND, CRS SAND & FN ROUNDED GRAVEL	5.0' - 5.66'
						S. MOIST DARK BROWN SANDW/FN GRAVEL, TRACE SILT	5.66' - 6.16'
9.0		GRAB			0.2	WET MED BROWN SAND W/ FN - MED GRAVEL, SOME SILT	9.0' - 9.25' WT @ 9.25'
10.0		SS-2 (10-12')	9-7-18-25	0.83'	0.0	SATURATED, OLIVE-BROWN CRS & FN SAND, TRC SILT	10.0' - 10.83'
							WELL SET @ 10.5'
							(BRIDGING SANDS)
13.0							REFUSAL @ 13.0'
							EOB 13.0'

**Attachment 2**

**Laboratory Chemical Analytical Results:  
August 20, 1998 Groundwater Sampling Event**



Laboratory Services

32 James Brown Drive  
Williston, Vermont 05495  
(802) 879-4333  
FAX 879-7103

REPORT OF LABORATORY ANALYSIS

CLIENT: KSKGeoS

PROJECT CODE: KSKG1330

PROJECT NAME: Sugarbush Service Station

REF.#: 125,760 - 125,765

REPORT DATE: August 26, 1998

DATE SAMPLED: August 20, 1998

Enclosed please find the results of the analyses performed for the samples referenced on the attached chain of custody. Chain of custody indicated sample preservation with HCl.

All samples were prepared and analyzed by requirements outlined in the referenced method and within the specified holding times. All instrumentation was calibrated with the appropriate frequency and verified by the requirements outlined in the referenced method. Blank contamination was not observed at levels affecting the analytical results.

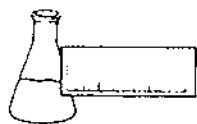
Analytical method precision and accuracy was monitored by laboratory control standards which included matrix spike, duplicate and quality control analyses. These standards were determined to be within established laboratory method acceptance limits.

Individual sample performance was monitored by the addition of surrogate analytes to each sample. All surrogate recovery data was determined to be within laboratory QA/QC guidelines unless otherwise noted.

Reviewed by,

Harry B. Locker, Ph.D.  
Laboratory Director

enclosures



**ENDYNE, INC.**

Laboratory Services

32 James Brown Drive  
Williston, Vermont 05495  
(802) 879-4333  
FAX 879-7103

**EPA METHOD 8021B--PURGEABLE AROMATICS**

CLIENT: KSKGeoS

DATE RECEIVED: August 20, 1998

PROJECT NAME: Sugarbush Service Station

REPORT DATE: August 26, 1998

CLIENT PROJ. #: 98017

PROJECT CODE: KSKG1330

Ref. #:	125,760	125,761	125,762	125,763	125,764
Site:	PW-1	MW-1	MW-2	MW-3	MW-6
Date Sampled:	8/20/98	8/20/98	8/20/98	8/20/98	8/20/98
Time Sampled:	12:45	13:05	13:25	13:45	14:05
Sampler:	J. Roman	J. Roman	J. Roman	J. Roman	J. Roman
Date Analyzed:	8/24/98	8/25/98	8/25/98	8/26/98	8/26/98
UIP Count:	0	0	0	0	0
Dil. Factor (%):	100	100	100	100	100
Surr % Rec. (%):	93	104	94	93	92
Parameter	Conc. (ug/L)	Conc. (ug/L)	Conc. (ug/L)	Conc. (ug/L)	Conc. (ug/L)
MTBE	TBQ <10	29.6	TBQ <10	<10	17.8
Benzene	<1	<1	<1	<1	<1
Toluene	<1	<1	<1	<1	<1
Ethylbenzene	<1	<1	<1	<1	<1
Xylenes	<1	<1	<1	<1	<1
1,3,5 Trimethyl Benzene	<1	<1	<1	<1	<1
1,2,4 Trimethyl Benzene	<1	<1	<1	<1	<1
Naphthalene	<1	<1	<1	<1	<1

Ref. #:	125,765				
Site:	Field Blank				
Date Sampled:	8/20/98				
Time Sampled:	14:25				
Sampler:	J. Roman				
Date Analyzed:	8/25/98				
UIP Count:	0				
Dil. Factor (%):	100				
Surr % Rec. (%):	98				
Parameter	Conc. (ug/L)				
MTBE	<10				
Benzene	<1				
Toluene	<1				
Ethylbenzene	<1				
Xylenes	<1				
1,3,5 Trimethyl Benzene	<1				
1,2,4 Trimethyl Benzene	<1				
Naphthalene	<1				

Note: UIP = Unidentified Peaks TBQ = Trace Below Quantitation NI = Not Indicated







KENT'S KOPITUCH, INC.  
 Geo-Environmental Services  
 164 OSGOOD HILL  
 ESSEX, VERMONT 05452  
 TEL/FAX: (802) 878-1620  
 E-mail: kskgeo@aol.com

**FAX**

TO:	FROM:	DATE:	REFERENCE
Harry Locker	John Roman	8/05/98	COC # 25386
		TOTAL PAGES: 1	Submitted 8/20/98
		PHONE: 879 4333	
		FAX: 879 7103	

SUBJECT: Sugar Bush Service Station COC # 25386

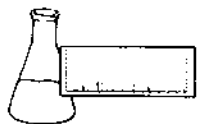
In your final laboratory report please use "MW-6"  
 in replacement of "MW-5" as the water sample obtained  
 on 8/20/98 at 1405 hrs (EPA 8021B) and 1415 hrs (MOD EPA 8015).  
 This well was one of 5 pre-existing wells and was incor-  
 rectly designated on the COC. Thank you

John C. Roman  
 Sampler

125,764 + 125,770

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**ENDYNE, INC.**

**Laboratory Services**

32 James Brown Drive  
Williston, Vermont 05495  
(802) 879-4333  
FAX 879-7103

*Received 9/4/98*

**REPORT OF LABORATORY ANALYSIS**

CLIENT: KSK GeoS  
PROJECT NAME: Sugarbush Service Station  
DATE REPORTED: September 1, 1998  
DATE SAMPLED: August 20, 1998

PROJECT CODE: KSKG1331  
REF. #: 125,766 - 125,771

Enclosed please find the results of the analyses performed for the samples referenced on the attached chain of custody record.

Chain of custody indicated sample preservation with HCl.

All samples were prepared and analyzed by requirements outlined in the referenced methods and within the specified holding times.

All instrumentation was calibrated with the appropriate frequency and verified by the requirements outlined in the referenced methods.

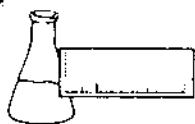
Blank contamination was not observed at levels affecting the analytical results.

Analytical method precision and accuracy were monitored by laboratory control standards which included matrix spike, duplicate and quality control analyses. These standards were determined to be within established laboratory method acceptance limits.

Reviewed by,

Harry B. Locker, Ph.D.  
Laboratory Director

enclosures



**ENDYNE, INC.**

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LABORATORY REPORT

TOTAL PETROLEUM HYDROCARBONS (TPH) BY MODIFIED EPA METHOD 8015

DATE: September 1, 1998  
CLIENT: KSK GeoS.  
PROJECT: Sugarbush Service Station  
PROJECT CODE: KSKG1331  
COLLECTED BY: John Roman  
DATE SAMPLED: August 20, 1998  
DATE RECEIVED: August 20, 1998

Reference #	Sample ID	Concentration (mg/L) <sup>1</sup>
125,766	PW-1; 1255	ND <sup>2</sup>
125,767	MW-1; 1315	ND
125,768	MW-2; 1335	ND
125,769	MW-3; 1355	ND
125,770	MW-6; 1415	ND
125,771	Field Blank; 1435	ND

Notes:

- 1 Value quantitated based on the response of Gasoline. Method detection limit is 0.1 mg/L.
- 2 None detected

# CHAIN-OF-CUSTODY RECORD

KSA Geos # 98017

25386

Project Name: Superbush Service Station		Reporting Address: KSA Geos 16405900d Hill Rd Essex VT 05452		Billing Address: KSA Geos 16405900d Hill Rd Essex VT 05452	
Site Location: Warren Vermont		Company: KSA Geos		Sampler Name: John Roman	
Endline Project Number: KSKG1331		Contact Name/Phone #: Kent Kaptach 1020		Phone #: 800-878-1620	

Lab #	Sample Location	Matrix	G R A B	C O M P	Date/Time	Sample Containers		Field Results/Remarks	Analysis Required	Sample Preservation	Rush
						No.	Type/Size				
125,766	PW-1	WATER	✓		8/20/98	2	40 VOA	DUG WELL	80213	HCL	
125,766	PW-1	WATER	✓		8/20/98	2	40 VOA	DUG WELL	80213	HCL	
125,767	MW-1	GW	✓		8/20/98	2	40 VOA		80213	HCL	
125,767	MW-1	GW	✓		8/20/98	2	40 VOA		80213	HCL	
125,768	MW-2	GW	✓		8/20/98	2	40 VOA		80213	HCL	
125,768	MW-2	GW	✓		8/20/98	2	40 VOA		80213	HCL	
125,769	MW-3	GW	✓		8/20/98	2	40 VOA		80213	HCL	
125,769	MW-3	GW	✓		8/20/98	2	40 VOA		80213	HCL	
125,770	MW-5	GW	✓		8/20/98	2	40 VOA	TANK PIT WELL	80213	HCL	
125,770	MW-5	GW	✓		8/20/98	2	40 VOA	TANK PIT WELL	80213	HCL	
125,771	FIELD BLANK	WATER	✓		8/20/98	2	40 VOA		80213	HCL	
125,771	FIELD BLANK	WATER	✓		8/20/98	2	40 VOA		80213	HCL	

Relinquished by: Signature *John C. Roman*

Received by: Signature *[Signature]*

Date/Time 8/20/98 1618 hrs

Date/Time

Relinquished by: Signature *John C. Roman*

Received by: Signature

Date/Time

Date/Time

New York State Project: Yes No A

Requested Analyses EPA 80213 WATER 2 MOD. EPA 8015 TPH

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
pH						TKN	Total P	Total Diss P	BOD <sub>5</sub>	Alkalinity	Total Solids	TSS	TDS	Hardness	Conductivity	Meals (Specify)	Coliform (Specify)	COD	BTLN	EPA 601/602	EPA 624	EPA 625 B/N or A	EPA 418.1	EPA 608 Post/NCB	EPA 8080 Post/NCB	EPA 8270 B/N or Acid	EPA 8010/8020	EPA 8080 Post/NCB	EPA 8080 Post/NCB	EPA 8270 B/N or Acid

Other (Specify)



KENT S. KOPITZKE, INC.  
Geo-Environmental Services  
144 OSGOOD HILL  
ESSEX, VERMONT 05452  
TELE/FAX: (802) 878-1620  
E-mail: kskgeo@aol.com

**FAX**

TO:	FROM:	DATE:	REFERENCE
Harry Locker	John Roman	8/05/98	COC # 25386
		TOTAL PAGES: 1	Submitted 8/20/98
		PHONE: 879 4333	
		FAX: 879 7103	

SUBJECT: Sugar Bush Service Station COC # 25386

In your final laboratory report please use "MW-6" in replacement of "MW-5" as the water sample obtained on 8/20/98 at 1405 hrs (EPA 8021B) and 1415 hrs (MOD EPA 8015). This well was one of 5 pre-existing wells and was incorrectly designated on the COC. Thank you

John C. Roman  
Sampler

125,764 + 125,770

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